

# RAID Subsystem DVA-12T

DVA-12T iSCSI Premium Series



**BOSCH**

**en** Installation Manual



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# 1 Warnings and Certifications

## 1.1 Warning

A shielded power cord is required in order to meet FCC emission limits and also to prevent interference with nearby radio and television reception.

Use only shielded cables to connect I/O devices to this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

## 1.2 Safety Precautions

### Precautions and Instructions

- Prior to powering on the subsystem, ensure that the correct power range is being used.
- The RAID subsystem comes with 12 drive bays. Leaving any of these drive bays empty will greatly affect the efficiency of the airflow within the enclosure, and will consequently lead to the system overheating, which can cause irreparable damage.
- If a module fails, leave it in place until you have a replacement unit and you are ready to replace it.
- Airflow Consideration: The subsystem requires an airflow clearance, especially at the front and rear. The airflow direction is from front to back.
- Handle subsystem modules using the retention screws, eject levers, and the metal frames/face plates. Avoid touching PCB boards and connector pins.
- To comply with safety, emission, or thermal requirements, none of the covers or replaceable modules should be removed. Make sure that all enclosure modules and covers are securely in place during operation.
- Be sure that the rack cabinet into which the subsystem chassis will be installed provides sufficient ventilation channels and airflow circulation around the subsystem.
- Provide a soft, clean surface to place your subsystem on before working on it. Servicing on a rough surface may damage the exterior of the chassis.
- If it is necessary to transport the subsystem, repackage all drives separately.
- Dual redundant controller models come with two controller modules that must be installed into the subsystem. Single controller modules come with a single controller module and a metal sheet is placed over the lower controller bay at the rear of the subsystem. Since single controller modules cannot be upgraded, this metal sheet should NEVER be removed.

### ESD Precautions

Observe all conventional anti-ESD methods while handling system modules. The use of a grounded wrist strap and an anti-static work pad are recommended. Avoid dust and debris in your work area.

## 1.3 Certification

FCC (applies in the U.S. and Canada)

### FCC Class B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules (47 CFR, Part 2, Part 15 and CISPR PUB. 22 Class B). These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with

this user's guide, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.



This device is in conformity with the EMC.

**CB** (Certified Worldwide)

This device meets the requirements of the CB standard for electrical equipment with regard to establishing a satisfactory level of safety for persons using the device and for the area surrounding the apparatus. This standard covers only safety aspects of the above apparatus; it does not cover other matters, such as style or performance.

## 2 Introduction

This hardware manual briefly introduces the DVA 12 T iSCSI-to-SATA-II storage subsystem shown in *Figure 2.1*.

### 2.1 Product Overview

The RAID subsystem comes with two (2) Ethernet host ports capable of large I/O transfers over iSCSI packets. The subsystems come in a 2U-profile rack-mountable chassis which houses a RAID controller module featuring complete RAID configuration and maintenance functionality. The subsystem's operation is protected by redundant hot-swappable power supplies and cooling fan modules. Designed for high level of availability, all major components are hot-replaceable including its Li-ION battery, and the RAID-protected disk drives.

The iSCSI storage supports the connection to network initiators compatible with the IETF iSCSI standard (RFC 3720).

The subsystem facilitates data packaging, using the Internet SCSI (iSCSI) protocols, and transmission of block I/Os over LANs. The subsystem is ideal for location-independent data storage, backup, and retrieval. It combines the capabilities and block-level performance of RAID storage with the high-speed, low-cost, and long-distance Ethernet networking technologies.

Configured arrays are easily combined with multiple ID/LUNs on host ports, turning massive capacity into manageable units for data-sharing in a heterogeneous environment.



**Fig. 2.1** RAID Subsystem DVA-12T

This high-density subsystem supports up to twelve (12) hot swappable, SATA-II hard drives in a 2U-profile chassis. The subsystem is powered by the RAID controller board featuring the latest ASIC266 ASIC as the XOR engine and a pre-installed 1 GB DDR RAM DIMM module.

The controller board is housed in a metal canister and is referred to as the “controller module.” The controller module is comprised of a PCB board, a rear faceplate, and a metal canister. The controller module is accessed through the rear of the subsystem with the help of two hand screws. An battery backup unit (BBU) can be installed in the upper left side of the controller module (when viewed from the rear of the subsystem). The BBU is hot swappable and is accessed through the rear of the subsystem enclosure.

Two (2) RJ-45 connectors connect the RAID controller to network switches or Ethernet ports of independent devices. Three (3) hot-swappable cooling modules protect the subsystem from overheating, and two (2) hot-swappable power supply unit (PSU) modules provide constant power to the subsystem. The modular nature of the subsystem and the easy accessibility to all major components ensure the ease of the subsystem maintenance.

A maximum of 31 units can be connected to the subsystem.

#### **iSCSI Host Ports**

**Connectivity:** - The iSCSI host ports are capable of 2 GBps Ethernet with full duplex transmission. Storage volumes are associated with simulated ID/LUNs on the host channels. These volumes then appear as iSCSI targets over the network. The connection of these host ports is

identical with connecting Ethernet network devices either point-to-point to iSCSI initiators or using Ethernet switches.

*Other Concerns:* - Subnet, gateway, and other access control mechanisms can be applied with the iSCSI port connection.

The RAID subsystem supports connection through Ethernet networks to servers (iSCSI initiators) using iSCSI HBAs or SCSI packet processing software compliant with the IETF iSCSI standard (RFC 3720).

*Channels:* - The SCSI-like ID/LUN mapping method enables users to associate storage volumes with simulated IDs or LUNs on the host channels. On the drive side, all of the twelve (12) SATA drives are connected each through a dedicated SATA channel. Each drive channel is routed to an enclosure drive tray that is equipped with a standard SATA connector with hot-swap capability. The methods used for assembling physical drives, fault management, and status monitoring are identical to that used with the traditional RAID storage.



### NOTICE!

On receiving and unpacking your subsystem, please check the package contents against the included Unpacking Checklist. If any modules are missing, please contact your subsystem vendor immediately.

## 2.2 Enclosure Chassis

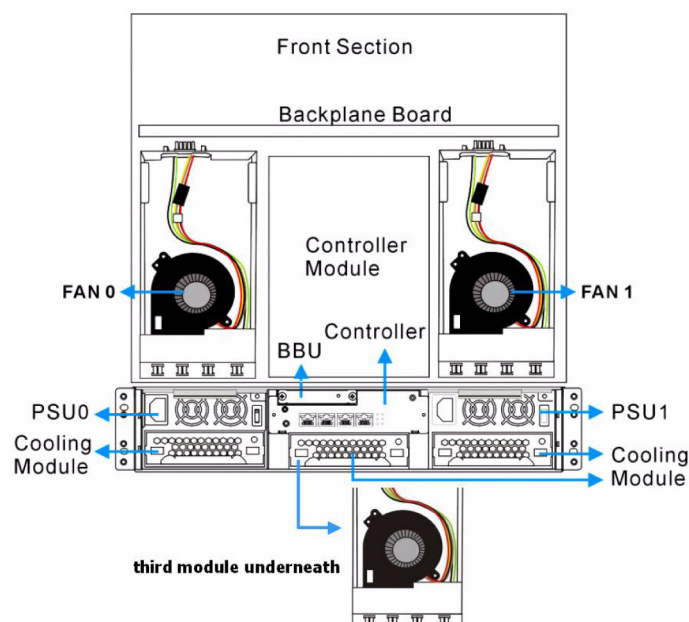
### 2.2.1 Chassis Overview

The RAID storage subsystem chassis is a 2U metal chassis that is divided into front and rear sections. Key components are respectively accessed through front and rear panels. The pre-drilled mounting holes in the sides of the 2U RAID subsystem enclosure allow you to attach separately purchased slide rails so that you can install the enclosure into a standard 19-inch rack or enclosure cabinet.



### NOTICE!

Components accessed through the front panel are referred to as “Front Panel Components” and components accessed through the rear panel are referred to as “Rear Panel Components.”

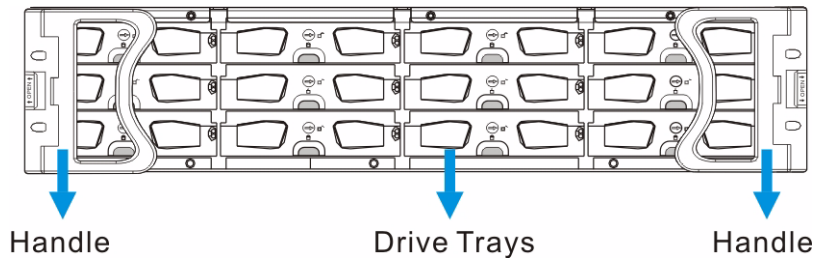


**Fig. 2.2** Locations of Key Components



### 2.2.2 Front Panel Overview

The front section of the subsystem features a 4x3 layout for twelve (12) 3.5-inch drives. The two (2) handles on the front of the subsystem enable you to easily insert/extract the chassis into/from a rack or cabinet. The front panel of the RAID subsystem described in this manual is shown in *Figure 2.3*. A description of each front panel component is given below:



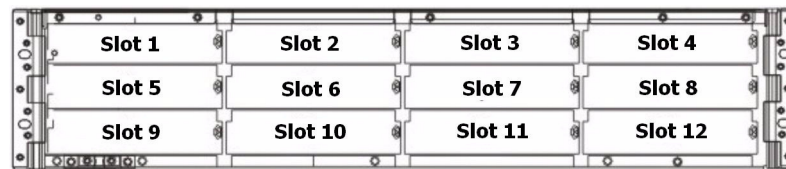
**Fig. 2.3** RAID Subsystem Front View

The front panel shown in *Figure 2.3* accommodates the following components:

- Drive bays with drive tray canisters: The drive bays house the hard drives.
- Forearm handles: The subsystem has right and left handles for easier rackmounting and handling.

### 2.2.3 Hard Drive Numbering

The front section of the RAID subsystem enclosure houses twelve (12) hard drives in a 4x3 configuration as shown in *Figure 2.4*. When viewed from the front, the drive bays (slots) are numbered 1 to 12 from left to right, from top to bottom.

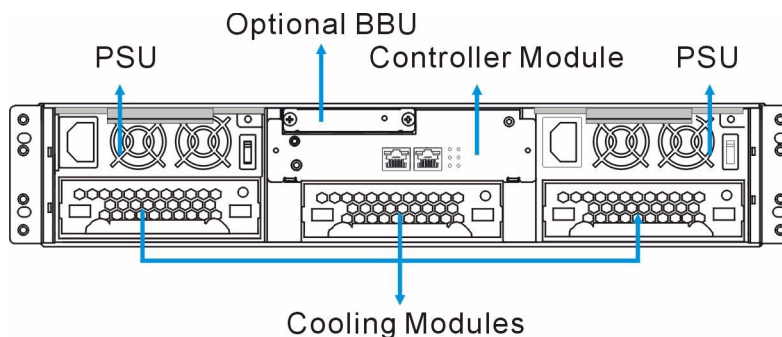


**Fig. 2.4** Hard Drive Numbering

### 2.2.4 Rear Panel Overview

The rear section of the RAID subsystem is accessed through the rear panel and is reserved for a single RAID controller module, one (1) BBU, two (2) power supply units (PSUs), and three (3) cooling modules.

A rear view of the subsystem is shown below. Descriptions of each rear panel component are given below:



**Fig. 2.5** RAID Subsystem Rear View

The rear panel shown in *Figure 2.5* accommodates the following components:

- *RAID controller module*: A controller board and a DDR RAM DIMM module are housed in the controller module to provide the system RAID functionalities. (See *Section 2.3.3 The RAID Controller Module*)
- *BBU module*: An BBU module sustains cache memory during a power shortage to prevent data loss. (See *Section 2.3.6 BBU*)
- *PSU modules*: The hot-swappable PSUs provide power to the subsystem. A power switch is located on the right of each PSU to turn the system on and off. (See *Section 2.3.7 Power Supply Units*)
- *Cooling modules*: The redundant cooling modules ventilate the subsystem to reduce the temperature within the subsystem. (See *Section 2.3.8 Cooling Modules*)

## 2.2.5 Backplane Board

An internal backplane board separates the front and rear sections of the RAID subsystem. The PCB board consists of traces for logic level signals and low voltage power paths. It contains no user-serviceable components.

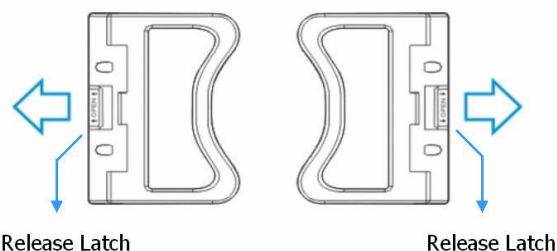
### CAUTION!

When inserting a removable module, DO NOT USE EXCESSIVE FORCE! Forcing or slamming a module can damage the pins on the module connectors either on the module itself or on the backplane. Gently push the module until it reaches the end of module slot. Feel the contact resistance and use slightly more pressure to ensure the module connectors are correctly mated. If the module comes with reject levers or retention screws, use them to secure the module.

## 2.3 Subsystem Components

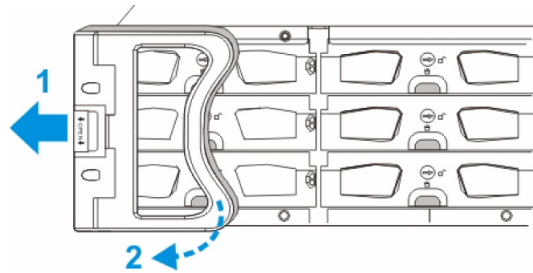
The RAID subsystem houses many active components and most of them can be accessed through either the front or rear panel. The modular design of the active components facilitates their easy installation and removal. Hot-swap mechanisms are incorporated to eliminate power surges and signal glitches that might occur while removing or installing these modules.

### 2.3.1 Front Handles



**Fig. 2.6** Handles

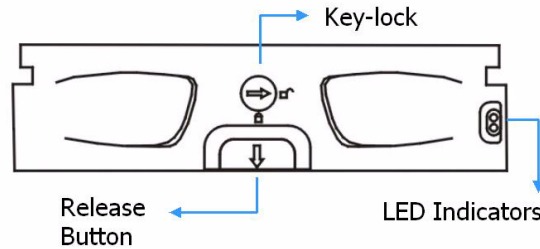
A left and a right handle are installed on the front side of the chassis. Each handle has a release latch to secure the position of the handle when closed. (See *Figure 2.6*) To access drive bays in the left or right column behind the handles, first flip the release latch on the enclosure front handles, and then swing the handles to the left and right sides, respectively. (See *Figure 2.7*) To close the handles, swing the handles toward the system; gently press the handles until a click is heard. The latches will keep the handles in place.



**Fig. 2.7** Opening One of the Front Handles

### 2.3.2

#### Drive Trays



**Fig. 2.8** Drive Tray Front View

The RAID subsystem comes with twelve (12) drive trays (see *Figure 2.8*) designed to accommodate separately purchased, standard 1-inch pitch, 3.5-inch disk drives. The drive bays are easily accessible from the front of the enclosure. Two (2) LEDs on the front of the tray indicate the drive status. A key-lock on each drive tray secures the hard drive in place, while an easily accessible release button ensures fast and efficient drive hot-swapping.

#### **CAUTION!**

Be careful not to warp, twist, or contort the drive tray in any way (e.g., by dropping it or resting heavy objects on it). The drive tray has been customized to fit into the drive bays in the RAID subsystem. If the drive bay superstructure is deformed or altered, the drive trays may not fit into the drive bay.

### 2.3.3

#### The RAID Controller Module

The RAID controller module contains a main circuit board, a preinstalled 1 GB capacity (or above) DDR RAM DIMM module, and the controller module interfaces. The controller module contains no user-serviceable components. Except when installing/upgrading the cache memory inside, the controller module should never be removed or opened.

#### **CAUTION!**

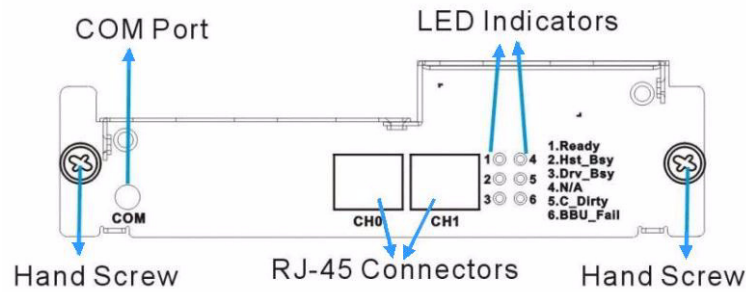
Although the RAID controller can be removed, the only time you should touch the controller itself is to install the memory modules. The RAID controller is built of sensitive components and unnecessary tampering can damage the controller.

The heart of the RAID controller subsystem is the iSCSI-to-SATA controller board. The controller comes with two (2) Ethernet host ports. The subsystem connects to the host through RJ-45 connectors, while the connectors are also ready to connect to one or more network switches, enabling access to your storage volumes in complex configurations such as data-sharing or network zoning.

The docking connector at the rear of the controller board connects the controller module to the backplane board. A DDR RAM DIMM socket is strategically placed in an easily accessible location on the controller board for easy insertion of the DDR RAM DIMM module.

### 2.3.4 Controller Module Interfaces

All external interfaces that connect to external devices are located on the controller module rear panel shown below. The interfaces are listed below.



**Fig. 2.9** Controller Module Interfaces – 2-port version

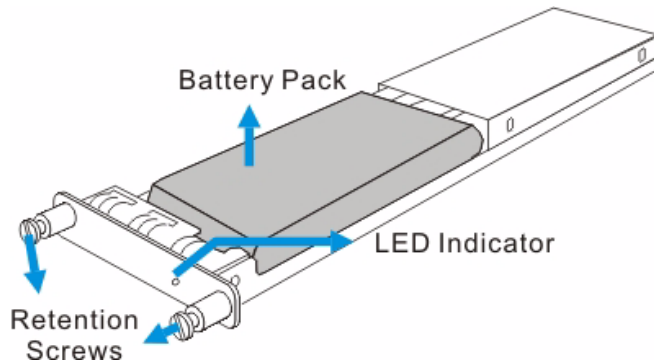
- Host ports: Two (2) Gigabit Ethernet host ports (simulated and indicated as CH0 and CH1 in the diagram shown above) connect the RAID subsystem to the networked iSCSI initiators through two (2) RJ-45 connectors.
- COM port: The controller module comes with one (1) COM port. This port is used for local access to the firmware embedded configuration utility from a management computer.
- LED indicators: Five (5) LED indicators illustrate the system statuses for system monitoring. Please see *Section 4 Subsystem Monitoring* for more information.
- Hand screws: Two (2) hand screws located in the sides of the controller rear panel provide easy controller module installation and secure the controller module in place.

### 2.3.5 DIMM Module

The controller module comes with a preinstalled 1 GB capacity or above DDR RAM DIMM module. The DIMM module is placed in an easily accessed location on the controller board. However, when the DIMM module is being changed, the controller module must be removed from the subsystem chassis.

### 2.3.6 BBU

An Li-ION battery backup unit (BBU) module (see *Figure 2.10*) can sustain cache memory for days after a power failure. If you purchased a BBU, it will be installed on the upper left side of the controller module in the rear of subsystem chassis.



**Fig. 2.10** BBU Module

In accordance with international transportation regulations, the BBU module is only charged to between 35% and 45% of its total capacity when shipped. Therefore, when powering on the subsystem for the first time (see *Section 5.3 Power On*) the BBU will begin to charge its batter-

ies to their full capacity. It normally requires approximately twelve (12) hours for the battery to be fully charged. If the battery is not fully charged after twelve (12) hours, there is a problem with the BBU module and you should contact your subsystem vendor immediately. While the battery is being charged, the LED on the BBU rear panel and the sixth LED on the rear panel of the controller module will flash. (See *Section 4.2.5 BBU Module LED* and *Section 4.2.6 PSU LEDs* for details on the LED indicators.)

You can check the status of the battery's charge via RAIDWatch or the firmware utility screen.

### 2.3.7 Power Supply Units

The RAID subsystem is equipped with two (2) redundant, hot-swappable, 350W PSUs, which are accessed through the rear of the enclosure. The PSU is permanently mounted into a 2U (dual-level) bracket especially designed to house both the PSU and a cooling module, which is mounted in the lower part of the 2U bracket.

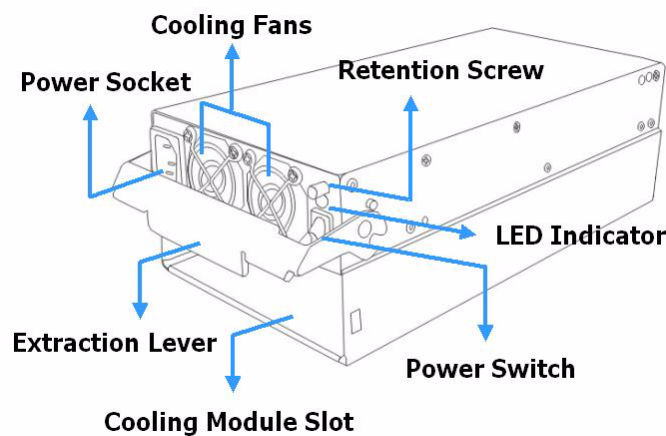


#### NOTICE!

Hot-swapping the PSU also removes the cooling module at the lower slot.

As shown in *Figure 2.11*, each PSU comes with a single power socket for power cord plug-in, and a power switch on the right to turn the subsystem on and off. Two (2) embedded cooling fans provide sufficient airflow to keep the PSU cool. A single LED indicates the PSU status. When any power supply failure occurs, such as over-voltage or fan failure, the LED shines red. A handle at the back of the PSU has been especially designed to enable you to remove the PSU from the subsystem while the subsystem is online. This should only be done if the PSU has failed and needs to be replaced.

A retention screw at the top of the PSU module secures the PSU to the enclosure. To remove the PSU, the retention screw must be removed first. When installing a new PSU module, make sure that the retention screw has been firmly secured.



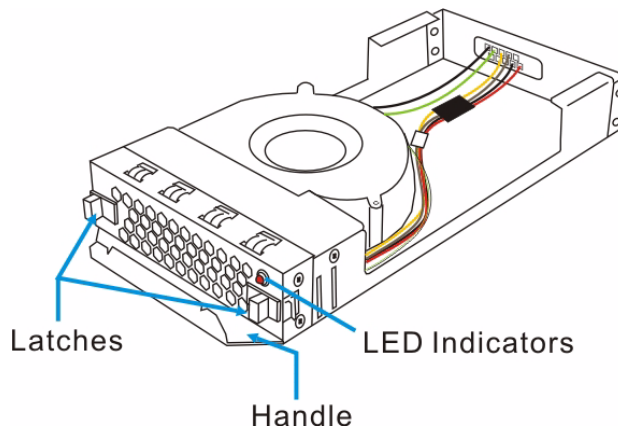
**Fig. 2.11** PSU Module

For the PSU specifications, please refer to *Section 8 Spare Parts and Accessories*.

### 2.3.8 Cooling Modules

The two subsystem models are all equipped with three (3) 1U, single-fan, hot-swappable cooling modules. They are installed in the cooling module slots located underneath the controller module and PSU modules (see *Figure 2.12*.) The cooling fans operate at two (2) fan speed levels. When the subsystem is running in normal ambient temperature, the fans operate at the lower speed. When the upper temperature threshold is exceeded, the fans automatically raise

their rotation speed to generate more cooling air to extract the heat generated by the hard drives.



**Fig. 2.12** Cooling Module

## 2.4 Subsystem Monitoring

The RAID subsystem comes with a number of different monitoring methods that provide you with continual updates on the status of the system and individual components. The following monitoring features are included in the subsystem.

### 2.4.1 I<sup>2</sup>C bus

The following elements are interfaced to the RAID controller over a non-user-serviceable I<sup>2</sup>C bus:

- Cooling modules
- Temperature sensors (for detecting the temperature of the backplane board and controller board)

### 2.4.2 LED Indicators

The following active components come with LEDs to indicate the status of the individual component:

- RAID controller (9 LEDs)
- BBU module (1 LED)
- Cooling modules (1 LED on each module)
- PSU modules (1 LED on each module)
- Drive trays (2 LEDs on each tray)

### 2.4.3 Firmware (FW)

The firmware is pre-installed software used to configure the subsystem. The latest firmware functionalities include Task Scheduler, Intelligent Drive Handling, and Media Scan. Media Scan handles low quality drives in both the degraded mode and during the rebuild process. Maintenance tasks will then be performed on an entire array or specific hard drives. Various options are user-configurable such as priority, start time, and execution intervals.

### 2.4.4 Audible Alarms

The RAID subsystem comes with audible alarms that are triggered when certain active components fail or when pre-configured (RAID controller or subsystem) thresholds are exceeded. Whenever you hear an audible alarm from the RAID subsystem, it is imperative that you determine the cause and rectify the problem immediately.

---

Event notification messages indicate the completion or status of array configuration tasks and are always accompanied by two (2) or three (3) successive and prolonged beeps.

---

**CAUTION!**

Failing to respond when an audible alarm is heard can lead to permanent damage of the RAID subsystem. When an audible alarm is heard, rectify the problem as soon as possible.

---

## 2.5 Hot-swappable Components

### 2.5.1 Hot-swap Capabilities

The RAID subsystem comes with a number of hot-swappable components. A hot-swap component is one that can be exchanged while the subsystem is still online without affecting the operational integrity of the subsystem. These components should only be removed from the subsystem when they are being replaced. At no other time should these components be removed from the subsystem.

### 2.5.2 Components

The following components are hot-swappable:

- Power supply units (PSUs)
- Cooling modules
- BBU module
- Hard drives

### 2.5.3 Normalized Airflow

Proper subsystem cooling is referred to as “normalized” airflow. Normalized airflow ensures the sufficient cooling of the subsystem and is only attained when all components are properly installed. Therefore, a failed component should only be hot-swapped when a replacement is available. If a failed component is removed but not replaced, permanent damage to the subsystem can result.

## 3 Hardware Installation

### 3.1 Introduction

This chapter gives detailed instructions on how to install the subsystem. When installing the subsystem, it is necessary to mount the chassis into a rack or cabinet and to install hard drives and drive trays. Installation into a rack or cabinet should occur *before* the hard drives or drive trays are installed into the subsystem. Please confirm that you received all of the components listed on the *Unpacking List* that came with the subsystem before proceeding with the installation process.

---

**CAUTION!**

Please note that the installation instructions described in this manual should be carefully followed to prevent any difficulties and damages to your system.

---

### 3.2 Installation Prerequisites

1. *Static-free installation environment:* The RAID subsystem must be installed in a static-free environment to minimize the possibility of electrostatic discharge (ESD) damage. (See *Section 3.3.2 Static-free Installation*)
2. *Component check:* Before installing the RAID subsystem, you should first check to see that you have received all the required components. (See *Section 3.5 Unpacking the Subsystem*) If any items appear damaged, contact your vendor for a replacement.
3. *Cabling:* The RAID models all come with one (1) audio-jack-to-DB9 cable to facilitate the connection of the COM port for terminal emulation management. Two (2) power cords are provided for the power connections to the power sources. The RJ-45 cables for host and external devices connections are user-supplied. Please see *Section 5 Subsystem Connection and Operation* for sample topologies and configuration options.
4. *Memory module:* If you wish to change the pre-installed memory module, a separately purchased module must be installed. (See *Section 6.3 DIMM Module Replacement*)
5. *Rack installation:* The enclosure chassis can be installed into rack cabinet using separately purchased mounting rails, rear-attached brackets, or Bosch's slide rails (see *Section 3.6 Rack/Cabinet Installation*).

### 3.3 Safety Precautions

#### 3.3.1 Precautions and Instructions

1. Be sure the correct power range (100-120 or 220-240VAC) is supplied by your rack cabinet or power outlet.
2. **Thermal notice:** All drive trays (even if they do not contain a hard drive) must be installed into the enclosure. Leaving a drive bay or module slot open will severely affect the airflow efficiency within the enclosure, and will consequently lead to system overheating. Keep a faulty module in place until you have a replacement unit and you are ready to replace it.
3. An enclosure without disk drives can weigh over 24 kilograms. Two (2) people are required to install or relocate the subsystem. Drives should be removed from the enclosure before moving the subsystem.
4. **Airflow considerations:** The subsystem requires an airflow clearance especially on the front and rear. For proper ventilation, a minimum of 2.5cm is required between the front of the enclosure and rack cover; a minimum of 5cm is required between the enclosure and end of the rack.



5. Handle the system modules by the retention screws, eject levers, or the modules metal frames/face plates only. Avoid touching the PCB boards and connector pins.
6. None of the covers or replaceable modules should be removed in order to maintain compliance with safety, emission, or thermal requirements.
7. Always secure every enclosure module by its retaining screws or make sure it is held in place by its latches.
8. Always make sure the subsystem has a safe electrical earth connection via power cords or chassis ground by the rack cabinet.
9. Be sure that the rack cabinet in which the subsystem chassis is to be installed provides sufficient ventilation channels and airflow circulation around the subsystem.
10. Provide a soft, clean surface to place your enclosure on before working on it. Servicing the enclosure on a rough surface may damage the finish of the chassis.
11. If it is necessary to transport the subsystem, repackage all disk drives separately.

### 3.3.2

#### Static-free Installation

Static electricity can damage the system's electronic components. To prevent ESD damage to any of the components, follow these precautions before touching or handling them:

- Discharge the static electricity accumulated in your body by wearing an anti-static wristband.
- Avoid carpets, plastic, vinyl, and styrofoam in your work area.
- Handle all components by holding their edges or metal frames. Avoid touching the exposed circuitry on PCB boards and connector pins.

## 3.4

### General Installation Procedure

Following all the instructions provided below can save subsystem installation time. Detailed, illustrated instructions for each component are given in the following sections.

1. *Unpack:* Unpack the subsystem and confirm that all the components on the *Unpacking Checklist* have been included. (See *Section 3.5 Unpacking the Subsystem*)
2. *Rack/Cabinet installation:* If the subsystem is going to be installed in a rack or cabinet, it should be installed prior to installing the hard drives. Installing the subsystem into a rack or cabinet requires at least two (2) people. (See *Section 3.6 Rack/Cabinet Installation*)
3. *Install drive trays:* After the hard drives have been installed into the drive trays, the drive trays must be installed into the enclosure itself. (See *Section 3.7 Drive Tray Installation*)
4. *Cable connection:* Use the power cables that came with the subsystem to connect the subsystem to the main power source. Use self-purchased RJ-45 cables (see *Section 5 Subsystem Connection and Operation* for more details) to connect host ports to the network or external devices.
5. *Power up:* Once the components have been properly installed and all cables are properly connected, you can power up the subsystem and configure the RAID array. (See *Section 5.3 Power On*)

### Installation Procedure Flowchart

Table 3.1 shows a flowchart of the installation procedure. As you complete each step, check off the “Done” box on the right. Please use this flowchart in conjunction with the instructions that follow.

	Installation Procedure	Done	
1	Unpack	<input type="checkbox"/>	See Section 3.5 <i>Unpacking the Subsystem</i>
2	Rack/Cabinet Installation	<input type="checkbox"/>	See Section 3.6 <i>Rack/Cabinet Installation</i>
5	Drive Tray Installation	<input type="checkbox"/>	See Section 3.7 <i>Drive Tray Installation</i>
6	Cable Connection	<input type="checkbox"/>	
7	Power On	<input type="checkbox"/>	See Section 5.3 <i>Power On</i>

**Table 3.1** Installation Procedure Flowchart

## 3.5 Unpacking the Subsystem

Use the *Unpacking Checklist* in your package to verify package contents. Carefully check the items contained in each box before proceeding with installation.



### NOTICE!

A detailed packing list can be found in your product shipping package or product CD.

## 3.6 Rack/Cabinet Installation

The 2U RAID subsystem has been designed to fit into a standard cabinet or rack. Two (2) slide rails are available for installing the subsystem into a rack or cabinet (see Section 8.2 *Accessories*). The subsystem should be installed in the rack or cabinet *before* the hard drives and the drive trays are installed. If the drive trays with the associated hard drives are installed, the subsystem will be too heavy to mount into a rack or cabinet. When installing the subsystem into a rack or cabinet it is advisable that three (3) people assist in the mounting process.

To install the subsystem into a rack or cabinet, please refer to the installation instructions that came with the slide rails.

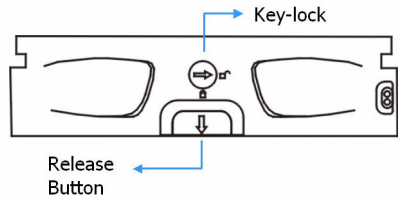
## 3.7 Drive Tray Installation

Once the hard drives have been installed in the drive trays, the drive trays can be installed into the RAID subsystem.

### CAUTION!

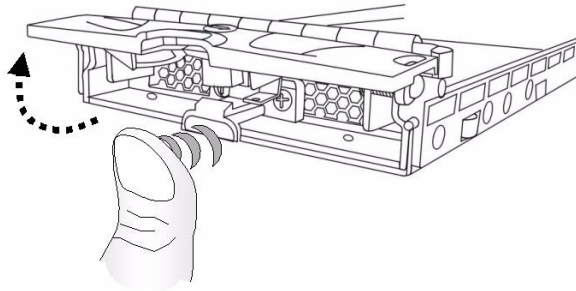
All drive trays must be installed into the enclosure even if they do not contain a hard drive. If the trays are not installed into the enclosure, the ventilation required for cooling will not be normalized and the subsystem will overheat.

1. All drive trays must be installed into the enclosure even if they do not contain a hard drive. If the trays are not installed into the enclosure, the ventilation required for cooling will not be normalized and the subsystem will overheat. Make sure *the key-lock is in the unlocked position*, i.e., the groove on its face is in a horizontal orientation. If the groove is in a vertical position, then the key-lock is locked and the front flap on the drive tray cannot be opened.



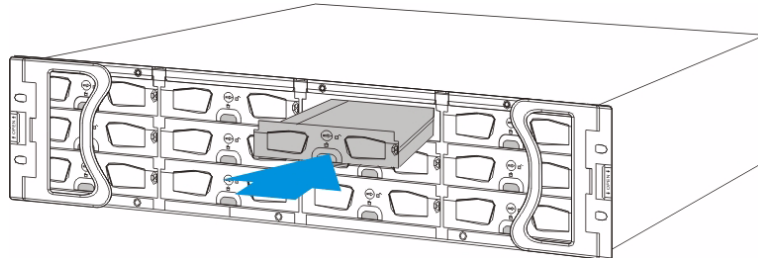
**Fig. 3.1** Front View of an Individual Drive Tray

2. *Open the front flap on the drive tray.* (See Figure 3.2) Push the release button on the front of the drive tray. The front flap will open in an upward direction.



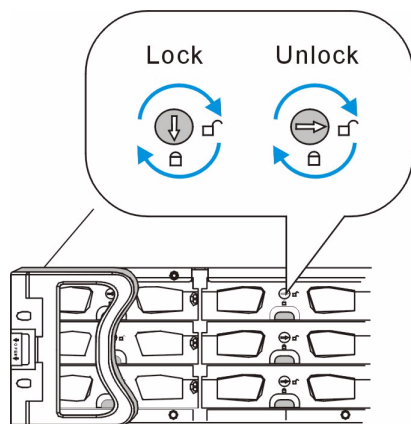
**Fig. 3.2** Drive Tray Front Flap

3. *Align the drive tray with the slot* in which you wish to insert it. Make sure that it is resting on the rails inside the enclosure. Once the drive tray is lined up with the slot, gently slide it in. This should be done smoothly and gently. (See Figure 3.3)



**Fig. 3.3** Installing a Drive Tray

4. *Close the front flap on the drive tray.* Make sure the front flap is closed properly to ensure that the SATA connector at the back of the drive tray is firmly connected to the corresponding connector on the backplane board. If the front flap is not closed properly, the connection between the hard drive and the subsystem will not be secure.
5. *Lock the flap into place* by turning the key-lock until the groove on its face is pointing down (vertical orientation). (See Figure 3.4)



**Fig. 3.4** Drive Tray Key-lock Rotation

6. Once the drive tray is inserted, the RAID subsystem will recognize the drive and scan it in automatically.

## 4 Subsystem Monitoring

### 4.1 Subsystem Monitoring Overview

The RAID subsystem is equipped with a variety of self-monitoring features that help to keep subsystem managers informed of the subsystem operational status. These monitoring features provide vital feedback to help you maintain the operational integrity of the subsystem. Prompt response to warnings and subsystem component failure notifications will improve the overall operation of the subsystem and help ensure the longevity of the RAID subsystem.

Self-monitoring features include:

- **Firmware (FW):** The controller in the RAID subsystem comes with preinstalled firmware, which can be accessed using a PC hyper-terminal connected through the RAID subsystem's COM port. Device status information can be obtained from the FW configuration utility.
- **RAIDWatch:** RAIDWatch is a fully integrated, Java-based, Graphical User Interface (GUI) that came with the subsystem and can be used to monitor and maintain the subsystem using your web browsers. Connection to RAIDWatch is made using the existing Ethernet ports.
- **The RAIDWatch Panel View** can be customized to show a direct, graphical representation of the RAID subsystem in the content panel of the RAIDWatch screen. Panel View allows you to quickly determine the operational status of critical components.
- **Bosch RAIDWatch Server:** The Bosch RAIDWatch Server is a powerful module that runs as an independent program from RAIDWatch and can be installed redundantly on different hosts. It is used for event notification via email, fax, LAN broadcast, SNMP traps, MSN Messenger, ICQ, SMS (Short Message Service), and the configuration utility screen. The Configuration Client helps prevent blind time and keeps you constantly informed as to the status of the storage management subsystem. Instructions on how to activate the Configuration Client functionality are given in the RAIDWatch User's Manual.
- **LEDs:** Device-status-indicating LEDs are located on all active components. These LEDs inform you of the integrity of a given component or a given link. You should become familiar with the different LEDs that are present on the subsystem and be aware of their functions. (See *Section 4.2 Status-indicating LEDs*)
- **Audible alarm:** An audible alarm is present on the subsystem controller board and will be triggered if any of a number of threatening events occurred. These events usually jeopardize the functional and operational integrity of the controller board and must be heeded at all times. Events such as a breaching of the temperature threshold will trigger the alarm. If a subsystem manager is present, the manager should use the PC hyper-terminal to determine the cause of the alarm and take the appropriate corrective measures. (See *Section 4.3 Audible Alarm*)
- **Inter-Integrated Circuit (I2C):** The I2C bus monitors the operational integrity of the cooling modules, RAID controller board temperature and voltage readings.

Subsystem monitoring is a necessary part of subsystem management. If failure events or other disruptive events are detected and reported, the subsystem managers must take the appropriate action to rectify the problem. Failure to act in a properly specified manner to a system event (like overheating) can cause severe and permanent damage to the subsystem.

## 4.2 Status-indicating LEDs

### 4.2.1 Brief Overview of the LEDs

The following devices all come with LEDs that inform subsystem managers about the operational status of the component on which they are mounted. The RAID subsystem has status-indicating LEDs distributed over the active components in the following ways:

Component	LEDs per Unit	Total LEDs	Definition
Drive Trays	2	24	See Section 4.2.2 Drive Tray LEDs
Controller Module	9	9	See Section 4.2.3 Controller Module LEDs
Ethernet Ports	2	4 (2 ports)	See Section 4.2.4 Ethernet Port LEDs
BBU Module (if BBU is installed)	1	1	See Section 4.2.5 BBU Module LED
PSU Module	1	2	See Section 4.2.6 PSU LEDs
Cooling Module	1	3	See Section 4.2.7 Cooling Module LEDs

Table 4.1

### 4.2.2 Drive Tray LEDs

Two (2) LED indicators are located on the right side of each drive tray. (See Figure 4.1) Refer to Table 4.2 for the LED definitions. When notified by a drive failure message, you should check the drive tray indicators to find the correct location of the failed drive. Replacing the wrong drive can fail two members of a logical array and thus render the array data unrecoverable.

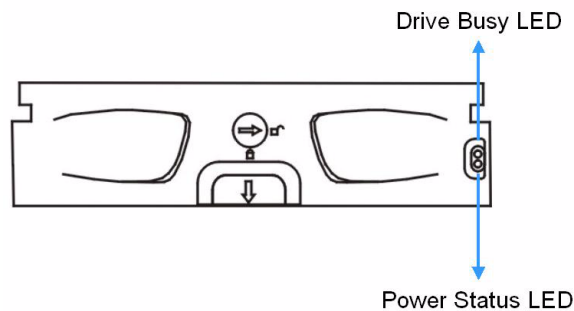


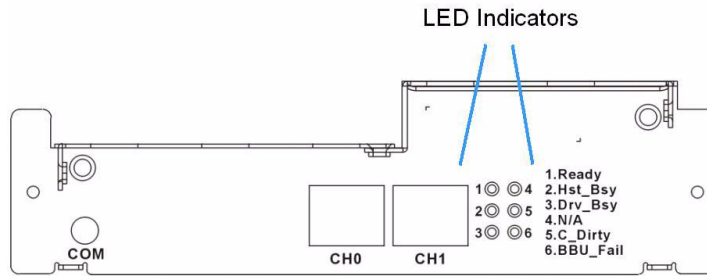
Fig. 4.1 Drive Tray LEDs

Name	Color	Status
Drive Busy	Blue	FLASHING indicates data is being written to or read from the drive. The drive is busy. OFF indicates that there is no activity on the drive.
Power Status	Green/ Red	GREEN indicates that a drive is installed in the drive tray RED indicates that there is a drive failure.

Table 4.2 3-2: Drive Tray LED Definitions

### 4.2.3 Controller Module LEDs

The rear panel of the controller module is shown in *Figure 4.2*. The LEDs on the controller’s faceplate that can be accessed from the rear of the enclosure are numbered from 1 to 6. The definitions are shown in *Table 4.3*.



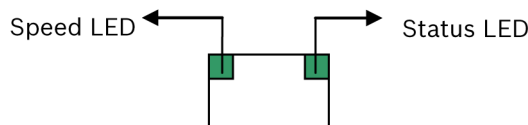
**Fig. 4.2** LEDs on the Controller Module

LED	Name	Color	Status
1	Ready	Green	FLASHING indicates controller initialization is taking place. ON indicates the controller is active and operating normally. OFF indicates the controller is not ready for operation.
2	Hst_Bsy (Host Busy)	Green	FLASHING indicates there is activity on the host ports. OFF indicates there is no activity on the host ports.
3	Drv_Bsy (Drive Busy)	Green	FLASHING indicates there is activity on the drive side. OFF indicates there is no activity on the drive side.
4	N/A	-	Currently not defined
5	C_Dirty (Cache Dirty)	Amber	ON indicates that data is currently being cached in memory or is being held up by the BBU during a system power loss.
6	BBU_Fail	Amber	ON indicates the BBU has failed and cannot sustain the cache memory. OFF indicates the BBU can sustain cached data in memory. FLASHING indicates the BBU is charging.

**Table 4.3** Controller Module LED Definitions

### 4.2.4 Ethernet Port LEDs

Two (2) host ports, which provide two (2) connection speeds, are on the rear of the controller module. Shielded or non-shielded, Cat6 straight-through Ethernet cables can be used to connect the RJ-45 ports to the network. Two (2) LEDs located on each Ethernet port indicate the Ethernet connection speed and status. See *Figure 4.3* for the locations of the two (2) LED indicators. Refer to *Table 4.4* for the LED definitions.



**Fig. 4.3** LAN Indicators

Name	Color	Status
<b>Speed LED</b>	Green	ON indicates the connection speed is running at 1Gigabit per second OFF indicates the connection speed is running at 10/100Mb per second
<b>Status LED</b>	Green	ON indicates currently connected to a LAN FLASHING indicates active transmission

**Table 4.4** LAN Port LED Definitions

## 4.2.5

### BBU Module LED

The BBU module has an LED on the right side of the rear panel. (See *Figure 4.4*) The function is the same as the sixth LED on the controller module. The LED is off when the BBU is functioning normally and is able to sustain the cache memory. The LED flashes to indicate the BBU is charging. If the LED is illuminating amber, please re-charge the BBU or contact your system vendor to verify the problem.

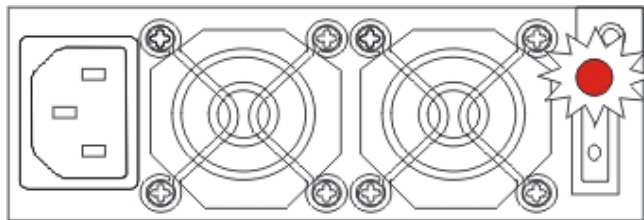


**Fig. 4.4** BBU Module LED

## 4.2.6

### PSU LEDs

Each PSU comes with a single LED at the back (see *Figure 4.5*), located just above the power switch that turns on the subsystem. This LED indicates the operational status of the PSU module. Please refer to the PSU LED definitions shown in *Table 4.5*.



**Fig. 4.5** PSU Module LED

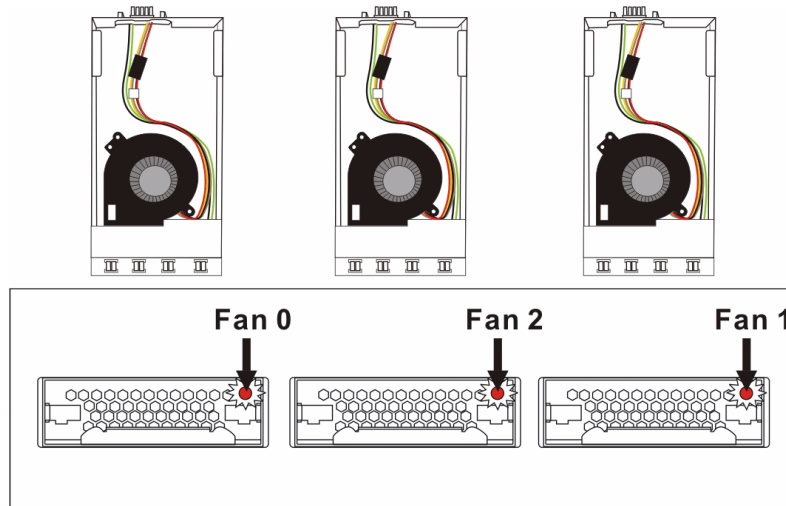
Color	Status
<b>Flashing Green</b>	The power supply has not been turned on. The PSU module LED will blink when the subsystem is connected to a power source but not yet turned on.
<b>Static Green</b>	The PSU is operating normally and experiencing no problem.
<b>Static Red</b>	The PSU has failed and is unable to provide power to the subsystem.
<b>OFF</b>	The PSU is not turned on. The PSU module LED will remain off even if the power cable has been plugged in but the power switch is not turned on.

**Table 4.5** PSU Module LED Definitions



### 4.2.7 Cooling Module LEDs

Each cooling module has one (1) red LED on the back. The LED corresponds to the single fan in the cooling module. (See *Figure 4.6*) When the LED is on, it indicates the fan has failed. When the LED is off, it indicates the fan is functioning properly.



**Fig. 4.6** Cooling Module LEDs and Cooling Fan Locations

The subsystem has a novel approach to stabilizing the temperature within the subsystem: When the intelligent sensors on the backplane detect higher temperature, such as high ambient temperature or the failure of any cooling or PSU module, the system will turn the cooling fans to high speed to extract more heat. Once the ambient temperature cools down to normal or the cooling or PSU modules have been replaced, the cooling fans will return to low speed.

## 4.3 Audible Alarm

Different controller environmental and operational parameters (like temperature, etc.) have been assigned a range of values between which they can fluctuate. If either the upper or lower thresholds are exceeded, an audible alarm will automatically be triggered. The alarm will also be triggered when an active component on the RAID subsystem fails. If the RAID subsystem manager is onsite and hears an alarm, the manager must read the error message on the PC terminal or RAIDWatch screen to determine what has triggered the alarm. After determining what has occurred, the RAID subsystem manager must take appropriate actions to rectify the problem.

### CAUTION!

If an alarm is triggered it is necessary for you to determine the problem. If the audible alarm is ignored and the problem is not rectified, unexpected damages may occur.

#### 4.3.1 Default Threshold Values

*Table 4.6* shows the default threshold values for the RAID subsystem. If any of these values are surpassed, the alarm will sound:

	Upper Threshold	Lower Threshold
<b>+3.3V</b>	+3.6V	+2.9V
<b>+5V</b>	+5.5V	+4.5V
<b>+12V</b>	+13.2V	+10.8V
<b>CPU Temperature</b>	95°C	5°C
<b>Controller Board Temperature</b>	80°C	5°C
<b>Enclosure Ambient Temperature</b>	40°C	0°C

**Table 4.6** Default Threshold Values

The thresholds in *Table 4.6* are default threshold values and may be changed.

### 4.3.2

#### Failed Devices

If any of the following components fails, the audible alarm will be triggered:

- RAID controller module
- Cooling fan modules
- PSU modules
- BBU module
- Hard disk drives



#### NOTICE!

When the temperature exceeds a preset threshold, the controller's charger circuits will stop charging. You will then receive a message that says "Thermal Shutdown/Enter Sleep Mode." When the temperature falls back within normal range, the battery will resume charging.

## 4.4

### I<sup>2</sup>C Monitoring

The operating status of PSU and cooling fan modules are collected through an I<sup>2</sup>C serial bus. If either of these modules fails, the failure will be detected and you will be notified through the various methods described above.

## 5 Subsystem Connection and Operation

### 5.1 Cabling

Following are the requirements on the type of cables used to connect the subsystem's iSCSI host ports:

- Gigabit Ethernet network cables.
- Cat6 type cables or better performance types.
- Straight-through Ethernet cables with RJ-45 plugs.
- Use of cross-over cables can also automatically be detected and re-routed for a valid connection.

Connection can be made directly to iSCSI initiators or through Gigabit Ethernet switches, to servers equipped with an iSCSI HBA, and then to client stations with a normal NIC or iSCSI HBA. The subsystem presents its logical capacity volumes through SCSI-like IDs and LUN's, and these volumes appear as iSCSI targets through the network.



#### NOTICE!

All cables must be handled with care. Make sure Ethernet cables do not run parallel with power cords. To prevent interference within a rack system, the cable routing path must be carefully planned and they must not be bent.

### 5.2 Host Connection Topologies

The RAID subsystem provides two Gigabit Ethernet ports. The host-side connection can be made as the following:

- Directly attached to the VIP X1600 encoder unit
- Connection through Ethernet Switch

Network configurations, such as subnet or VLAN settings, can be applied as long as permanent IPs are available with the subsystem's iSCSI host ports. Automatic assignment methods, such as DHCP, are not recommended for configuring the iSCSI connection. RAIDWatch need to access the array over standard TCP/IP and RAIDWatch may not recognize an array if port IPs have been changed.

#### Channel Default Settings

Model	Host Channels	Drive Channels
RAID subsystem	CH0 and CH1	Channels 2 to 13, each dedicated to one connected drive

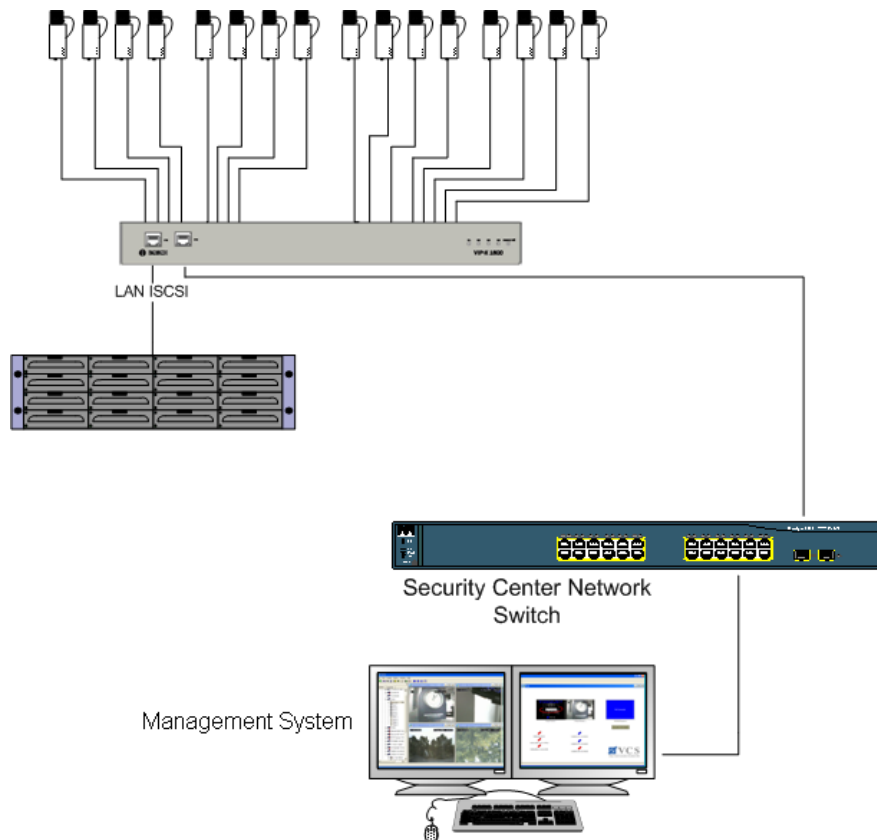
**Table 5.1** Subsystem's Default Channel Settings

### 5.2.1 Direct-Attached, Single Connection

In the configuration shown in *Figure 5.1*, the iSCSI drive is attached directly to the VIP X1600 encoder unit. The advantage of this configuration is recording traffic is not loaded onto the network. Furthermore, a general network failure will not affect the recording.

**NOTICE!**

There is no traffic in the network. In case of net failure recording will not be interrupted.



**Fig. 5.1** Sample Topology: Multiple Servers Each with Single Connection

### 5.2.2 Connection through an Ethernet Switches

In the configuration shown in *Figure 5.2* all codecs and cameras are connected via an Ethernet Switch. This is a standard configuration for using IP cameras and codecs sharing the same iSCSI drive.

A maximum of 31 units can be connected. In this case, a unit is defined by having one (1) IP address, so e.g. a unit can be either a VIP X1, a Dinion IP camera or one VIP X1600 module.

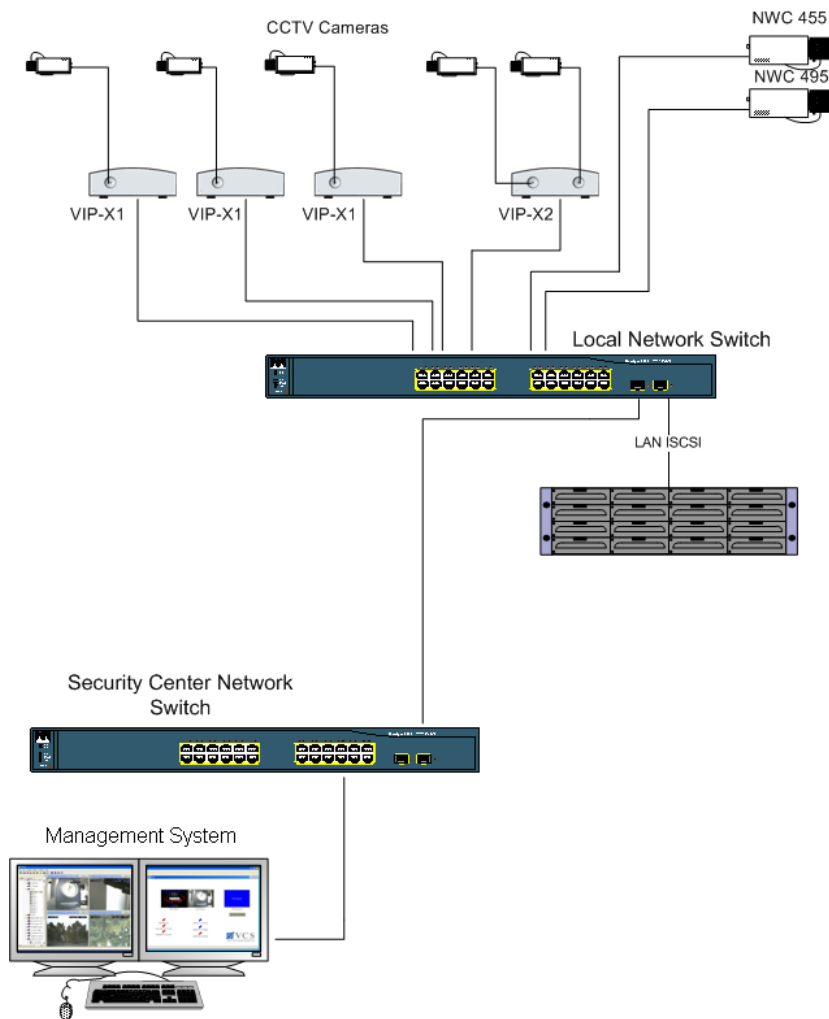


Fig. 5.2 Connection through an Ethernet Switch

## 5.3 Power On

Once all the components have been installed in the RAID subsystem, the iSCSI ports have been connected to the network, power on the network devices, the subsystem, and then power on the servers/iSCSI initiators.

### 5.3.1 Check List

Before powering on the RAID subsystem, please check the following:

- *Memory Modules* – Memory modules have been correctly installed on the controller boards. You may skip this if you have not changed the pre-installed module.
- *BBU Modules* – If used, that the BBU modules have been installed correctly.
- *Hard Drives* – Hard drives have been correctly installed on the drive trays.
- *Drive Trays* – ALL the drive trays, whether or not they have a hard drive, have been installed into the subsystem.
- *Cable Connections* – The iSCSI ports on the subsystem have been correctly connected to the initiator or the Ethernet network.
- *Power Cords* – The power cords have been connected to the PSU modules on the subsystem and plugged into main power.
- *Ambient Temperature* – All the subsystem components have been acclimated to the surrounding temperature.

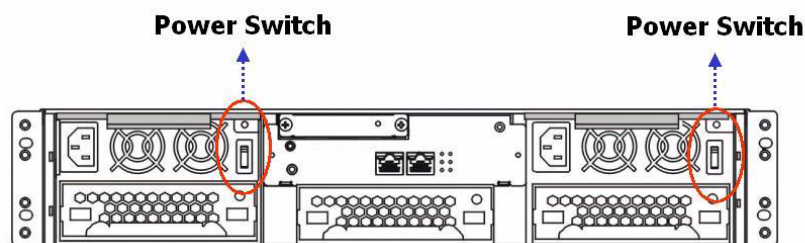
### 5.3.2 Power On Procedure

When powering on the RAID subsystem, please follow these steps.

1. Power on the network connection devices.  
These devices include the Ethernet switches, iSCSI routers, and any other such devices that have been connected to the RAID subsystem. Please refer to the documentation that came with your network device to see the power on procedure.
2. Power on the RAID subsystem.  
The RAID subsystem should only be powered on after all the network connection devices have been powered on first. Consult your network administrators for proper network configurations. The power on procedure for the RAID subsystem is described below.
3. Power on the initiators.  
The servers or iSCSI initiators should be the last devices that are turned on. Please refer to the documentation that came with your initiator systems to see their own power on procedures.

### 5.3.3 Power On Enclosure

To power on the subsystem, turn on the two power switches located on the rear panel of the subsystem. (See *Figure 5.33*) Each switch controls a single PSU, therefore make sure that both switches are turned on. There is no limitation on which PSU should be powered on first.



**Fig. 5.3** RAID Subsystem Power Switches

**NOTICE!**

Although the PSUs are redundant and a single PSU can provide sufficient power to the system, it is advisable to turn both of the power switches on. If only one PSU is operating and fails, system operation will be terminated.

**5.3.4****Power On Status Check**

Once the subsystem has been powered on, the status of the entire subsystem should be checked to ensure that everything is running smoothly and that there are no complications or malfunctions.

- Controller Module LEDs – The controller ready, Host Ports Active, and Device Ports Active LEDs should all flash green.
- Drive Tray LEDs – The green LED for all the drive trays (that contain hard drives) should light up, showing that there is power.
- Firmware and RAIDWatch – The overall status of the system may be checked using the embedded firmware utility or the RAIDWatch GUI screen.
- *Audible Alarm - If any errors occur during the initialization process, the onboard alarm will sound in a hastily repeated manner.*

Drive tray LEDs should normally start flashing right after power-on, indicating the RAID control units are attempting to access the hard drives.

**NOTICE!**

The subsystem has been designed to run continuously. Even if a component failure occurs the fault can be corrected online.

**5.4****Power Off Procedure**

To power down the RAID subsystem, please follow these steps:

**NOTICE!**

When powering down the RAID subsystem, please ensure that no time-consuming processes, like a “Logical Drive Parity Regeneration” or a “Media Scan,” are taking place.

1. Stop I/O access to the system.  
Stop all I/O accesses to the RAID subsystem. Please refer to the related documentation of your applications.
2. Flush the cache.  
Locate the Cache\_Dirty LED on the back of controller module to check if there is still cached data in memory. Use the Shutdown Controller function to flush all cached data. This prepares the RAID subsystem to be safely powered down.
3. Turn off the power.  
Turn off the power switches at the top of the rear panel of the RAID subsystem. Once the RAID subsystem has been powered down, other devices connected to the subsystem may be powered down.

## 6 Subsystem Maintenance and Upgrading

### 6.1 Overview

#### 6.1.1 Maintenance

Constant monitoring and maintenance of your RAID subsystem will minimize subsystem downtime and preserve the working integrity of the system for a longer period of time. If any of the subsystem components fail, they must be replaced as soon as possible.

---

**CAUTION!**

Do not remove a failed component from the subsystem until you have a replacement on hand. If you remove a failed component without replacing it, the internal airflow will be disrupted and the system will overheat causing damage to the subsystem.

---

All of the following components can be replaced in case of failure:

1. Controller module – *Section 6.2 Replacing Controller Module Components*
2. Memory module – *Section 6.3 DIMM Module Replacement*
3. BBU module - *Section 6.4 Replacing a Faulty BBU Module*
4. PSU modules – *Section 6.5 Replacing a Failed PSU Module*
5. Cooling fan modules – *Section 6.6 Cooling Module Maintenance*
6. Hard drives – *Section 6.7 Replacing a Failed Hard Drive*

#### 6.1.2 General Notes on Component Replacement

- With the exception of the RAID controller module, all of the components on the RAID subsystem, including the PSU modules, cooling modules, and drive trays, are hot-swappable and can be replaced while the subsystem is still in operation
- Qualified technicians who are familiar with the RAID subsystem should be the only ones who make component replacements. If you are not familiar with the RAID subsystem and/or with RAID subsystem maintenance in general, it is strongly advised that you refer subsystem maintenance to a suitably qualified maintenance technician.
- Normalized airflow is directly dependent upon the presence of all subsystem components. Even if a subsystem component fails, it should not be removed from the subsystem until a replacement is readily at hand and can be quickly installed. Removing a subsystem component without replacing it can lead to permanent subsystem damage.
- When replacing any hot-swappable component, caution should be taken to ensure that the components are handled in an appropriate manner. The rough or improper handling of components can lead to irreparable damage.

When, if necessary, removing a RAID controller module from the subsystem, ensure that the power has been turned off and that all precautionary measures, without exception, are adhered to. The controller board is very sensitive and can be easily damaged.

---

**CAUTION!**

When inserting a removable module, DO NOT USE EXCESSIVE FORCE! Forcing or slamming a module can damage the pins on the module connectors either on the module itself or on the backplane. Gently push the module until it reaches the end of module slot. Feel the contact resistance and use slightly more force to ensure the module connectors are correctly mated. If the module comes with reject levers or retention screws, use them to secure the module.

---



## 6.2 Replacing Controller Module Components

The controller module consists of the components shown below:

- DIMM Module  
The DIMM module can be replaced when the DIMM module fails or if a larger capacity DIMM module is required.
- Controller Module  
If the controller module in a single controller model fails, it is necessary to power the system down and replace the controller.

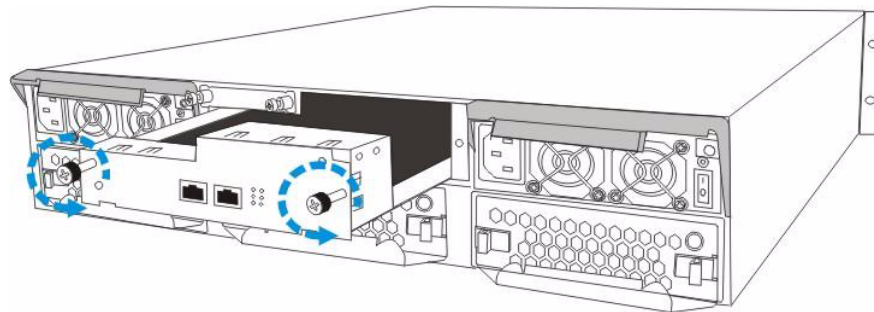
### 6.2.1 Controller Module Maintenance Overview

- The controller module contains a DIMM module. When replacing the controller module, these components can be removed and used on the new controller module if they are undamaged.
- When replacing the controller module, you must remember that the controller board is one of the most sensitive components in the RAID subsystem. All previously stipulated safety precautions (see *Section 3 Hardware Installation*) must be strictly adhered to. Failure to adhere to these precautions can result in permanent damage to the controller board.
- For your own safety and that of the subsystem, make sure that no power is being supplied to the system prior to replacing the controller module.

### 6.2.2 Removing the Controller Module

To remove the controller module:

1. Turn off the subsystem. If possible power off the subsystem in the way described in *Section 5 Subsystem Connection and Operation*. If it is not possible to do this turn off both PSU modules and disconnect the power cords.
2. Disconnect all cables that are connected to the controller module you wish to replace. These include the Ethernet cables connected to the network, and any cable connected to the RS-232C audio jack connector.
3. Loosen the retention hand screws. Hand screws are located on both sides of the RAID controller faceplate. Press these screws and loosen them so that the controller can be removed from chassis.



**Fig. 6.1** Loosening the Hand Screws from the Controller Module

4. *Remove the controller module.* Gently pull the controller module out of the subsystem.

### 6.2.3 Replacing the Controller Module

If the controller module has failed, it must be replaced. To replace a failed controller module:

1. Remove the failed controller module. (See *Section 6.2.2 Removing the Controller Module*)  
If the DIMM module is undamaged it can be removed (See *Section 6.3 DIMM Module Replacement*) and reused on the new controller module.
2. Install a DIMM module on the new controller module. (See *Section 6.3 DIMM Module Replacement*)
3. Insert the controller module. Align the controller module with the controller module bay at the rear of the subsystem. Gently slide the controller module in.
4. Fasten the hand screws. Once fully inserted secure the controller module to the subsystem by fastening the hand screws.
5. Re-attach all the cables that were removed. These include the cables that connect to the network or iSCSI initiators that were previously attached to the iSCSI ports, and any cable that was attached to the RS-232C audio jack connector.
6. Power up the system.

## 6.3 DIMM Module Replacement

The subsystem comes with a pre-installed 1 GB (or above) DDR RAM DIMM module on the controller. If DDR RAM DIMM modules with a different size need to be used or the original memory module is damaged in some way, the pre-installed modules must be removed and the new ones installed. Replacement and installation instructions are described fully below. The DIMM module is located on the controller board. The controller board is a sensitive component and must be treated with care to avoid being damaged.

---

#### CAUTION!

- The pre-installed modules must be removed prior to installing new memory modules. Do this with care. Sensitive components can be damaged during the process.
- The controller board in the controller module is a sensitive item. Please ensure that all anti-static precautions stipulated above are strictly adhered to. Only qualified technicians should replace the DIMM module.

---

### 6.3.1 DIMM Module Considerations

If the memory module on the subsystem controller module is going to be replaced, the following factors must be considered when purchasing replacement DIMM modules:

- Pre-installed DIMM module: The RAID comes with a 1 GB DDR RAM DIMM module pre-installed on the controller board. If you wish to change the size of the DIMM, then a new, separately purchased DIMM must be installed.
- Purchasing considerations: When purchasing a DDR RAM DIMM to install on the controller board, contact your vendor for an updated list of certified modules.
- DDR RAM DIMM modules supported: The RAID subsystem supports DDR RAM DIMM modules with memory capacities from 1 GB.
- Installation considerations: When installing the DIMM module, it is necessary to handle the controller module. The controller board is more susceptible to damage than the other components and must therefore be handled with extreme care. ALL anti-static precautions specified in *Section 3.3 Safety Precautions* must be strictly adhered to.
- Secure installation: When replacing the DIMM module, make sure that the new DIMM module is firmly in place prior to installing the controller module. If the DIMM module is not firmly in place, the subsystem will not run and the controller will need to be removed and the DIMM module correctly installed.

## 6.3.2 DIMM Module Replacement Procedure

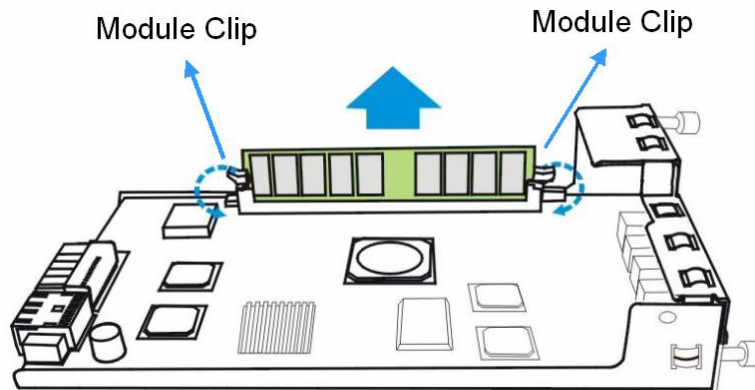


### NOTICE!

If you are going to replace or upgrade a DIMM module, please follow the instructions below. If you do not want to replace or upgrade a DIMM module and would like to install a controller module, please see *Section 6.2.3 Replacing the Controller Module*.

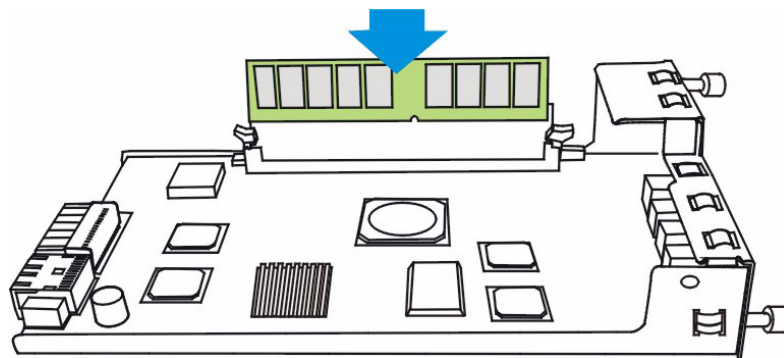
If a DIMM module fails or if a DIMM module with a higher memory capacity is required, the onboard DIMM module must be replaced. To replace the DIMM module:

1. Remove the controller module. See *Section 6.2.3 Replacing the Controller Module*.
2. Remove the previously installed DIMM module from the DIMM socket. To do this, push the white module clips on either side of the DIMM module down. By doing this, the previously installed modules will be ejected from the DIMM socket. (See *Figure 6.2*)



**Fig. 6.2** Push Back the Module Clips on the Sides of the DIMM Module

3. Gently pull the DIMM module out of the DIMM socket. (See *Figure 6.2*)
4. Insert the DIMM module into the DIMM socket. Align the DIMM module with the DIMM socket. Once aligned, gently push the DIMM module into the socket. The white clips on the sides of the socket will close automatically and secure the DIMM module into the socket.



**Fig. 6.3** Insert the DIMM Module

5. *Reinstall the controller module.* After the DIMM module has been properly installed, the controller module must be reinstalled. To do this, align the controller module with the controller module bay. Then gently push the controller module in the controller bay. Carefully push the controller until you feel the contact when the board edge connectors are mated to the backplane. Do not use force. If unusual contact resistance is felt, try it again. Next secure the controller module into the subsystem by fastening the hand screws on the sides.

## 6.4 Replacing a Faulty BBU Module

The BBU module is installed in the rear panel of the subsystem above the controller module. It consists of a battery cell pack enclosed in a metal bracket and connects directly to the back-plane board.

### 6.4.1 BBU Warnings and Precautions

- Install or replace the BBU supplied by your subsystem vendors only. Use of battery cells provided otherwise will void our warranty.
- Always dispose of discharged or used batteries in an ecologically responsible manner. Dispose used BBU at authorized battery disposal sites only.
- Do not use nor leave the BBU near a heat source. Heat can melt the insulation and damage other safety features of battery cells, possibly leading it to acid leak, and result in flames or explosion.
- Do not immerse the BBU in water nor allow it to get wet. Its protective features can be damaged. Abnormal chemical reactions may occur, possibly causing functional defects, acid leak, and other hazardous results.
- Do not disassemble or modify the BBU. If disassembled, the BBU could leak acid, over-heat, emit smoke, burst and/or ignite.
- Do not pierce the BBU with a sharp object, strike it with a hammer, step on it, or throw it. These actions could damage or deform it, internal short-circuiting can occur, possibly causing functional defects, acid leak, and other hazardous results.
- If the BBU leaks, gives off a bad odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately remove it from the subsystem and stop using it. If this is discovered when you first use the BBU, return it to Bosch or your system vendor.

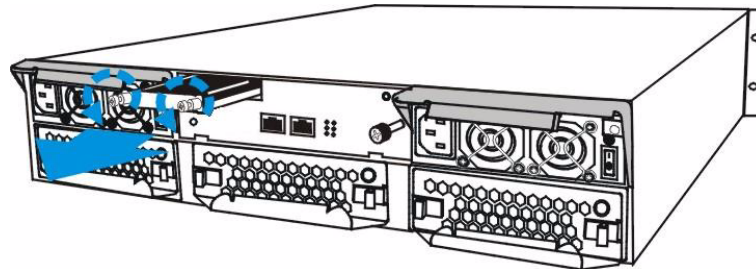
### 6.4.2 Procedure



#### NOTICE!

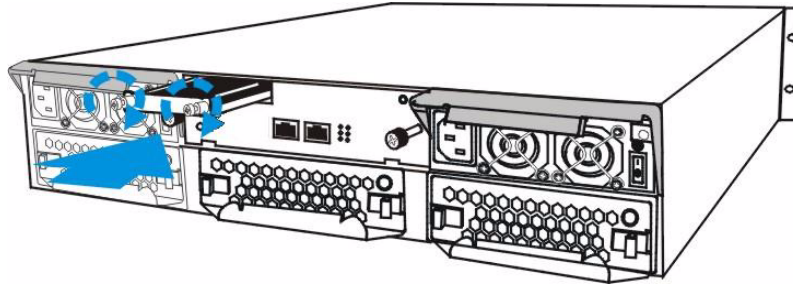
The BBU is hot-swappable and can be replaced while the subsystem is running. However, a new module will only be recognized after a subsystem reset. Carefully select the time when the reset will be made in order to minimize the overall disruption to service.

1. Remove the faulty BBU module from the chassis. The BBU module is secured to the chassis with two (2) spring screws. These screws must be loosen. To loosen, turn the screws counterclockwise. (See *Figure 6.4*)



**Fig. 6.4** Remove the Metal Sheet Retention Screws

2. Install the new BBU module. After the faulty BBU module has been removed, the new BBU module can be installed. To do this, align the BBU module with the empty slot, and then gently push the BBU module into the slot. (See *Figure 6.5*)



**Fig. 6.5** Install the BBU Module

- Secure the BBU module to the enclosure. Tighten the two (2) retention screws as shown above on the back of the BBU module.
- Once the new BBU module is correctly installed into the subsystem, the LED should start flashing, indicates the BBU is being charged. When the BBU is fully charged, the LED will light amber constantly.



**NOTICE!**

The life expectancy of a BBU is approximately 500 cycles. Follow the procedures above to replace an old BBU with a new BBU in order to maintain fault-tolerant subsystem functionalities. We recommend replacing the BBU yearly.

## 6.5

### Replacing a Failed PSU Module

#### 6.5.1

##### PSU Module Overview

- Two redundant PSU modules: The RAID subsystem comes with two fully redundant, hot-swappable PSU modules. These modules are located at the rear of the subsystem.
- Immediate replacement: When a PSU fails, it should ideally be replaced immediately. Do not remove the PSU module unless a replacement is readily available. Removing a PSU without a replacement will cause severe disruptions to the internal airflow and the subsystem will overheat, possibly causing irreparable damage to some of the subsystem components.



**NOTICE!**

Although the subsystem can operate using single PSU module, it is not advisable to run the RAID subsystem with a single PSU module for an extended period of time.

#### 6.5.2

##### Replacing the PSU Module

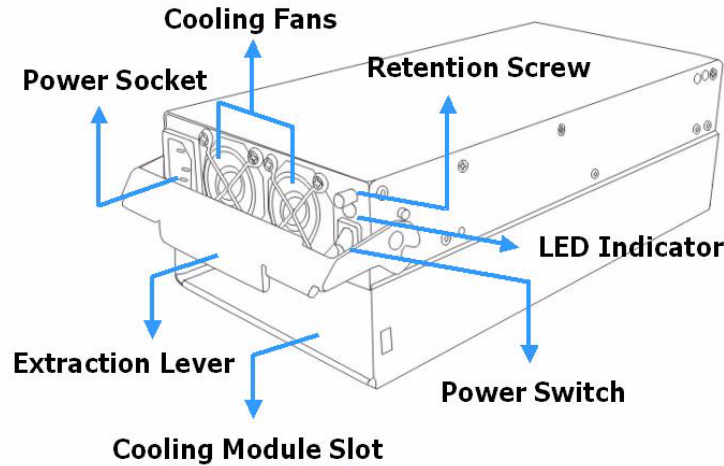


**NOTICE!**

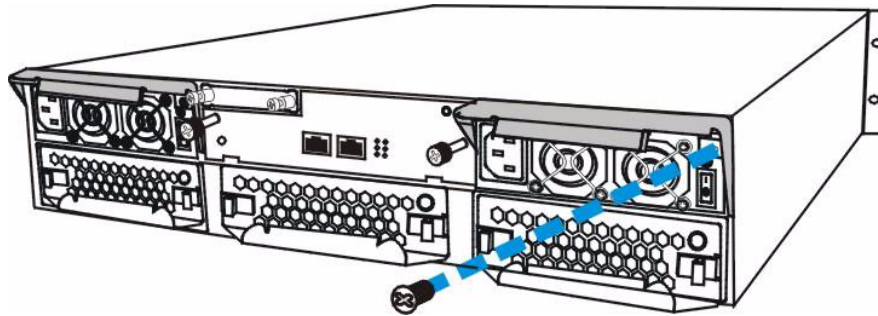
Before you insert a new PSU, be sure that it has the same warning label on its extraction lever as that shown on the lever of a remaining PSU. Double-check to avoid mixing a similar yet different PSU of another series.

To replace a PSU, please follow these steps:

- Turn off the PSU.* The power switch is located at the rear of the PSU. (See *Figure 6.6*)

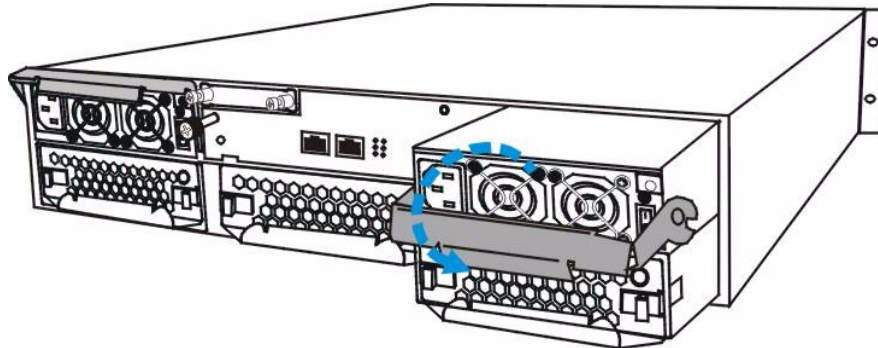


**Fig. 6.6** PSU Parts Identification



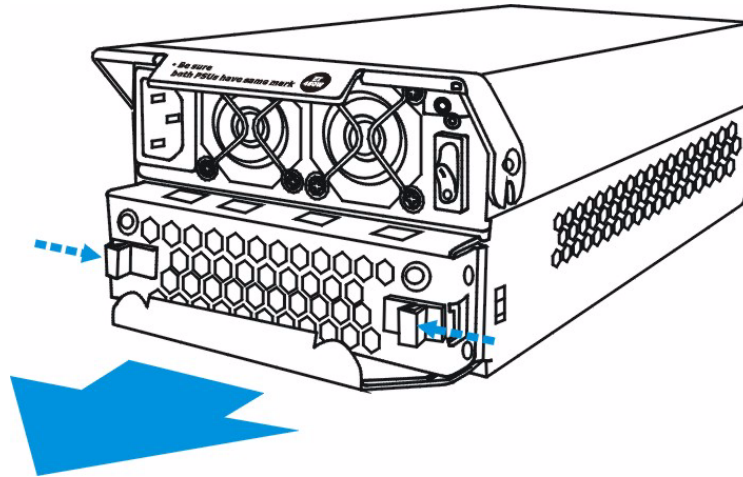
**Fig. 6.7** Removing the PSU Retention Screw

2. Once the power switch has been turned off, remove the power cable that connects the RAID subsystem to the main power. The power cable socket is found on the left-hand side of the module.
3. After the power cable has been removed from the socket, remove the retention screw at the top right-hand side of the PSU. (See *Figure 6.8*).
4. Remove the PSU module. Push the extraction lever at the back of the PSU module downwards. This will dislodge the PSU module from the subsystem. Once dislodged gently pull the PSU module out of the subsystem. (See *Figure 6.8*).



**Fig. 6.8** Removing the PSU Module

5. Remove the cooling module. To do this, push the clips on either side of the cooling module rear panel together. Then gently pull the cooling module out of the lower level of the PSU bracket. (See *Figure 6.9*)



**Fig. 6.9** Remove the Cooling Module

6. Reinstall the cooling module into the new PSU module. To do this, align the cooling module with the lower level of the PSU bracket and gently slide the cooling module in.
7. Reinstall the PSU module. After the cooling module has been reinstalled, align the PSU module with the empty bay from which the faulty module was removed. Gently slide the replacement PSU module into the subsystem.
8. Insert the cooling module.
9. Plug the PSU cable into the PSU module socket. Turn the power switch on.

## 6.6 Cooling Module Maintenance

### 6.6.1 Cooling Module Overview

- Redundant cooling modules: The RAID subsystem is equipped with redundant, hot-swappable, single-fan cooling modules. Two are located below the PSU modules. The third is located below the controller module. These cooling modules control the internal operational temperature of the subsystem and therefore their working integrity should be maintained at all times.
- Detecting a failed cooling fan module: If a cooling module fails, you can be notified of the failure by the LED located at the back of the module, an audible alarm, the firmware, the RAIDWatch Panel View, or the Configuration Client utility.
- Replacing a cooling module: When you are notified that a cooling module has failed, it should be replaced as soon as possible. A failed cooling module should only be removed from the subsystem when you have a replacement module that can be installed as soon as the failed cooling module has been removed.



#### NOTICE!

The latches at the back of the cooling module secure the cooling fan module into the enclosure. If these latches are broken, the warranty on the cooling fan module will be void.

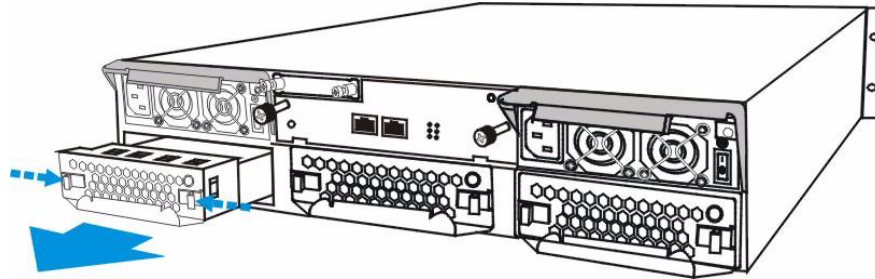
### 6.6.2 Replacing a Cooling Module

#### CAUTION!

Although the cooling fan modules are fully redundant, it is not advisable to run the RAID subsystem with one or two cooling modules for an extended period of time. Whenever a cooling module fails, the system is at risk of sustaining irreparable damage.

To replace a cooling module, please follow these instructions:

1. *Remove the cooling module.* Two (2) clips secure the cooling module to the subsystem. To remove the cooling module push these clips together and gently pull the cooling module out of the enclosure. (See *Figure 6.10*)



**Fig. 6.10** Removing the Cooling Module

2. Forcing or slamming a module into place can damage the pins on the module connectors either on the module itself or on the connectors of system backplane.
3. Install the new cooling module. To do this, align the replacement cooling module with the bay from which the faulty one was removed. Then gently slide the new cooling module into the enclosure subsystem.

## 6.7 Replacing a Failed Hard Drive

Hard drives for the subsystem can be purchased separately. When purchasing the hard drives, the following factors should be considered:

**Capacity (MB/GB):** Use drives with the same capacity. RAID arrays use a “least-common-denominator” approach. The maximum capacity of each drive used in the array is the maximum capacity of the smallest drive. Choose big drives with the same storage capacity.

**Profile:** The drive trays and bays of the system are designed for 3.5-inch wide x 1-inch-high hard drives. It is highly recommended that you do not try to use drives of any other size.

**Drive type:** The RAID subsystem described in this manual can use SATA-I or SATA-II hard drives. Please ensure that you purchase the correct hard drives.

### CAUTION!

- The hard drives and drive trays should only be installed into the subsystem after the subsystem has been mounted into a rack cabinet. If the hard drives are installed first, the subsystem will be too heavy to lift and the possible impact during installation may damage your drives.
- Handle hard drives with extreme care. Hard drives are very delicate. Dropping a drive onto a hard surface (even from a short distance) and hitting or touching the circuits on the drives with your tools may cause damage to the drives.
- Observe all ESD prevention methods when installing drives.
- Only use screws supplied with the drive canisters. Longer screws may damage the drive.

### 6.7.1 Hard Drive Maintenance Overview

- **Hot-swappable drive trays:** The drive trays are all hot-swappable. If a hard drive fails, it can be replaced while the subsystem is still running.
- **Open flap:** Once the flap on the drive tray has been opened, the drive tray must be removed from the subsystem. Failure to remove the drive tray from the subsystem after the flap has been opened may result in signal glitches and Data Compare Errors might ensue.



- Remove drives slowly: When removing a drive tray, withdraw it from the enclosure slowly. If the drive tray is removed too quickly a drive I/O timeout might occur.
- Replacement on-hand: Before removing a failed hard drive from the subsystem, make sure you have a replacement hard drive readily available. Do not leave the drive tray slot open for an extended period of time. If the drive tray slot is left unoccupied for an extended period of time, the airflow within chassis will be disrupted and subsystem components will overheat and may become permanently damaged.

## 6.7.2 Replacing a Hard Drive

When a hard drives fails, it needs to be replaced. To replace a hard drive, please follow these steps:

---

### CAUTION!

The hard drive is fragile; please always handle with extreme care. Do not drop the hard drive; always be slow, gentle and careful when putting down a hard drive. Only handle the hard drive by the edges, avoid touching any components or connectors.

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1. Identify the drive tray that contains a faulty drive that needs to be replaced.

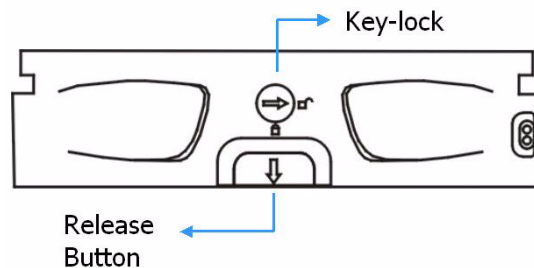
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### CAUTION!

Replacing the wrong drive in an array can fatally fail a RAID configuration. You should identify a failed drive from the RAIDWatch GUI screen, by checking the drive slot ID in the terminal screen, by checking the LEDs on the drive tray panel, and/or use the identify/flash drive function of firmware.

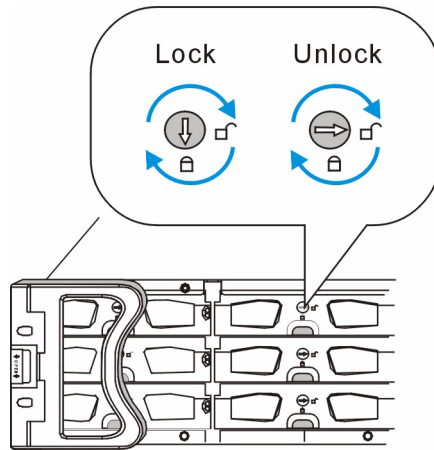
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2. Open the front flap. To open the front flap, push the release button at the front of the drive tray. (See *Figure 6.11*) The drive tray front flap will automatically be lifted and the drive tray will be dislodged from the chassis.



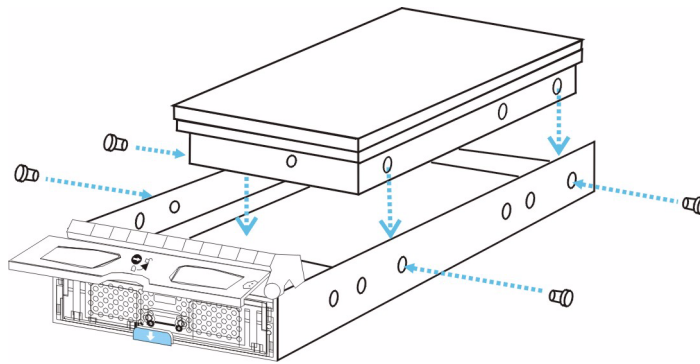
**Fig. 6.11** Front View of an Individual Drive Tray

3. Remove the drive tray. To remove the drive tray from the enclosure, the key-lock must be unlocked. (See *Figure 6.12*) To do this, turn the key-lock on the front of the drive tray until the groove on its face is in a horizontal orientation.



**Fig. 6.12** Drive Tray Key-Lock Rotation

4. Remove the drive tray with the hard drive. Once the drive tray is dislodged from the chassis, gently and carefully withdraw the drive tray with hard drive from the chassis.
5. Remove the retention screws. The hard drive is secured to the drive tray with four (4) retention screws (two on each side.) To remove the hard drive, these retention screws must be removed. (See *Figure 6.13*)



**Fig. 6.13** Removing the SATA Hard Drive

6. Install the new hard drive.

## 7 Specifications

### 7.1 Technical Specifications

Environmental Specifications	
Humidity	5 to 95% (non condensing – operating and non-operating)
Temperature	<i>Operating:</i> 0° to 40°C <i>Non-operating:</i> -40° to 60°C
Altitude	Sea level to 12,000ft

Power Requirements	
Input Voltage	115VAC @ 6A 240VAC @ 3A with PFC (auto-switching)
Frequency	47-63Hz
Power Consumption	1197 BTU/hour (350W)

Dimensions	w/o front handles	w/ front handles
Height	88mm	88mm
Width	446mm	482mm
Length	490mm	505mm
Package dimensions	344H x 600W x 670D mm	

System Weight
Net weight: 23.5kg Gross weight: 25.0kg (without drives)

EMI/EMC
<ul style="list-style-type: none"> <li>FCC Class-B</li> <li>CE</li> </ul>

Safety Requirements
<ul style="list-style-type: none"> <li>UL</li> <li>CB</li> </ul>

Shock	
Half-sine	<i>Operating:</i> 10G peak, 11ms duration <i>Non-operating:</i> 100G, 180 in/sec 240G, 2ms, half-sine
Square	240G, 2ms, half-sine

Vibration	
Operating	5 to 500Hz, 0.2G, X/Y/Z
Non-operating	5 to 500Hz, 1.0G, X/Y/Z

<b>Warning Alarms</b>
-----------------------

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Audible alarms</li> <li>• System LEDs</li> <li>• Event notification via the RAIDWatch Manager (LAN broadcast, email, fax, MSN, ICQ, SMS, and SNMP traps) and RS-232C terminal screen</li> </ul> |
|--|

## 7.2 Controller Specifications

Specification	
RAID Levels	0, 1(0 + 1), 3, 5, 10, 30, 50, JBOD, and non-RAID disk spanning
Host O/S Compatibility	Host O/S independent; determined by iSCSI offload utilities and hardware
Host Interface	RJ-45 Gigabit Ethernet
Host Channels	2 pre-configured host channels
Drive Interface	Supports up to 12 channels of 3Gbps SATA-II, SATA-I backward compatible
Drive Channels	All drive channels are pre-configured and cannot be changed
Cache Mode	Write-through, write-back, adaptive write policy
Cache Memory	Pre-installed 1 GB (or above) DDR RAM DIMM with/without ECC, registered; in one DIMM socket
Number of LUN's	Up to 32 per host ID
Multiple Target IDs/ Host Channel	Yes
Firmware on Flash Memory	Yes

Specification	
CPU	600MHz PowerPC 750FX
Gigabit Ethernet Chip Controllers	Intel 82546 x 1
DIMM Slot	One 184-pin DDR DIMM module
Flash ROM	32Mbit (4MB)
NVRAM	32KB with RTC
Hardware XOR	Yes
Real-time Clock	For event messages with time record

## 7.3 Drive Tray Specifications

Specification	
Height	28mm
Width	110mm
Depth	218.92mm
Key Lock	Yes

## 7.4 Power Supply Specifications

Specification	
Nominal Power	350W
DC Output	12.0V: 25A 5.0V: 25A 3.3V: 20A
Input Frequency	47 to 63Hz
AC Input	115VAC @ 6A or 240VAC @ 3A with PFC
Power Factor Correction	Yes
Hold-up Time	At least 16ms at 115/230VAC full load after a loss of AC input
Over-temperature Protection	Auto shutdown when lost cooling or exceeded ambient temperature; over-voltage protection is also available.
Cooling Fans	Two fans for each unit (inside PSU)

## 7.5 Cooling Module Specifications

Specification	
Speed	High or low rotation speed controlled by firmware
Max. Air Flow (each module)	High speed: 31.8 CFM Low speed: 20.1 CFM
Input Power	9/3.12W max.
Rated Voltage	DC 12V
Temperature	Operating: -10 to +60°C Storage: -20 to +70°C

## 7.6 RAID Management

Specification	
Configuration	<ul style="list-style-type: none"> <li>Text-based firmware-embedded utility over RS-232C through the included audio jack-to-DB-9 serial cable</li> <li>The RAIDWatch Manager program using Ethernet connection</li> </ul>
Performance Monitoring	Yes
Remote Control and Monitoring	Yes

Event Broadcast/Alert	Yes (via RAIDWatch sub-modules, the Configuration Client utility or NPC)
Event Notification	Yes (via RAIDWatch sub-modules, Configuration Client or NPC)
Hardware Connection	In-band over Ethernet, or RS-232C
Configuration on Disk	Configuration data stored on disks for logical drive assemblies to exist after controller replacement; basic settings, e.g., channel mode settings, are stored on NVRAM
Failure Indicator	Via alarm, LCD panel, RAIDWatch Manager session, or terminal emulation

## 7.7 Fault Tolerance Management

Specification	
Battery Back-up Option	Yes
Automatic Drive Failure Detection	Yes
Automatic Rebuild on Spare Drives	Yes
Regenerate Logical Drive Parity	Yes
Bad Block Reassignment	Yes
Automatic Rebuild upon Failed Drive Replacement	Yes
Manual Clone of Suspected Failed Drive	Yes
Concurrent Rebuild on Multiple Drives in a RAID (0 + 1) Logical Drive	Yes
Salvage the 2 <sup>nd</sup> Temporarily Failed Drive in a RAID 1, 3 or 5 Logical Drive	Yes
Salvage the 1 <sup>st</sup> Temporarily Failed Drive in a RAID 0 Logical Drive	Yes

## 8 Spare Parts and Accessories

### 8.1 Spare Parts

Spare parts that come with the subsystem are listed in *Table 8.1*.

Model Name	Description
DVA-SCIK-12A	iSCSI-to-SATA II RAID controller module, 2x 1 Gigabit Ethernet Host channels, 12 x SATA drive channels, 1 GB DDR RAM.
DVA-ADTK-000A	Drive tray, Type-III bezel and Type-II LED lightpipe
DVA-ADTK-050A	Drive tray including 500 GB Hitachi SATA drive
DVA-SPKK-08A	Power supply module, 2U DDR-interface subsystems, 350W capacity
DVA-SFAK-08A	Dual-speed version of cooling fan module: 2U sub-systems

**Table 8.1** Spare Parts Shipped with the Subsystem

### 8.2 Accessories

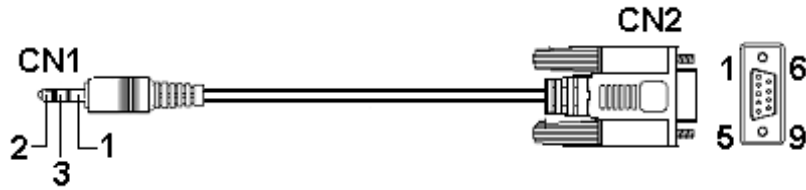
The Accessories and their model names are listed in *Table 8.2*.

Model Name	Description
DVA-ASRK-28A	Slide rails for 533 mm to 724 mm deep racks (21" to 28.5")
DVA-ASRK-36A	Slide rails for 647 mm to 914 mm deep racks (25.5" to 36")

**Table 8.2** Accessories Shipped with the Subsystem

## 9 Pin Outs

### 9.1 COM1 Cable: DB9 and Audio Jack Pin Outs



**Table 9.1** RS-232C (Audio Jack) Pin Outs  
COM 1 Cable: Connects a PC running a terminal emulation program

CN1 Pin Number	Pin Name
1	Ground
2	TXD
3	RXD

CN2 Pin Number	Pin Name
1	NC
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	NC
Pin 4 and Pin 6 are shorted	
Pin 7 and Pin 8 are shorted	

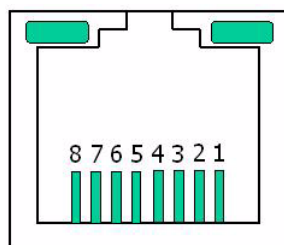
**Table 9.2** COM 1 Cable, RS-232C (Audio Jack) Pin Out Definitions



#### NOTICE!

A null modem is used for wire-swap and is necessary for connecting in between COM1CN2 and a PC serial port.

### 9.2 Ethernet Port Pin Outs





**Fig. 9.1** LAN Port Pin Outs

<b>Pin</b>	<b>Pin Name</b>	<b>Pin</b>	<b>Pin Name</b>
<b>1</b>	LAN_TXP	<b>5</b>	N2
<b>2</b>	LAN_TXN	<b>6</b>	LAN_RXN
<b>3</b>	LAN_RXP	<b>7</b>	N1
<b>4</b>	N2	<b>8</b>	N1

**Table 9.3** Ethernet Port Pin Outs

## 9.3

### Main Power

IEC-type receptacle.



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